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To Mr. A.D. Mosher
Manager
Route & Site Planning
H8G1

POSSIBLE EMI AT DND RADIO RECEIVING INSTALLATION NEAR CFB BORDEN

D.E. Jones

Based on the results of radio noise measurements on our 500-kV lines and on information in the technical literature, it is considered that the proposed 500-kV Bruce-Essa transmission line should not produce appreciable interference to reception at the DND radio receiving site near CFB Borden.

At the request of the Route and Site Planning Department, an investigation has been carried out to determine whether either of two proposed routes for the 500-kV Bruce-Essa transmission line might result in radio interference at the Department of National Defense (DND) radio receiving site near Canadian Forces Base (CFB) Borden. The two routes would pass between one and two kilometres from the site.

Radio signals in the LF and HF bands are received at this site at frequencies between about 130 kHz and 11 MHz. It is the desire of DND that background noise at the receiving site should not be increased by the presence of the proposed line. They recently carried out a series of background noise tests, in order to determine the noise levels they presently encounter/1/. These are shown as vertical lines on Figure 1, representing maximum noise levels usually encountered in the evening and minimum levels which are usually encountered in the morning. Our aim is to remain below the tops of these vertical lines.

Extensive EMI tests are presently being carried out by this department on the Milton-Claireville 500-kV lines. The proposed Bruce-Essa line will be of similar construction. Based on continuous measurements over a 34-day period, the maximum foul weather radio noise level has been determined. Using the correct-

ion factors discussed below, it is possible to predict the maximum radio noise at the DND receiving site. The various corrections are presented in Table 1, where the predicted radio noise at one and two kilometres from the line is derived.

1. Measured noise level - Radio noise was measured on an NM 21-FFT radio noise meter at 500-kHz, with quasi-peak detector, at 38 meters laterally from the 500-kV line. The maximum level measured was 60 dB above 1 μv/m. This occurred when it was raining at a rate of 1.5 cm per hour. At other times during the test period, rain rates as high as 6 cm per hour were recorded. The radio noise, however, did not exceed 60 dB above 1 μv/m.

2. Frequency Corrections - Frequency correction curves for radio noise on high voltage transmission lines are given in the CSA standard on EMI of electric power systems/2/. (These same curves are presented in the proposed federal radio regulations concerning permissible radio noise levels from power lines). The frequency corrections are shown in column 3 of Table 1.

3. Corrections to agree with DND Measurements - The DND background noise measurements were carried out using an NM 26-T noise meter with RMS detector. This meter has the same bandwidth as the NM 21-FFT, and should respond identically to power line noise. There is no simple theoretical correlation between quasi-peal and RMS detectors. Field tests have been carried out, however, using meters with both detectors/3/. They showed:
Ratio of QP/RMS = 10.0 dB at 500-kHz
= 8.9 dB at 1 MHz
= 8.4 dB at 1.65 MHz
There is no reason to expect large changes in this ratio with frequency, as long as the receiver bandwidth does not change. An average value of 9 dB is, therefore, used for all frequencies in column 4 of Table 1.

4. Conversion of Measuring Units - The power line noise measurements are given in dB above 1 μv/m. The DND measurements are in dB above kTo. Corrections, deduced from Table 4 of reference 1, are shown in column 5.

5. Lateral Attenuation - Very little work has been carried out on lateral attenuation of power line noise outside of the AM broadcast band, 0.54-1.6 mHz, or at distances beyond about 100 meters. One extensive field survey was carried out in the 1960's/4/. Based on its results, the author's presented lateral attenuation curves for the whole RF band up to 10 GHz and for distances up to 15 km. Much of this was theoretical,

but was verified by the field measurements for distances out to about 300 meters. These curves are used to predict the lateral attenuation from 38 metres to one and two kilometres, columns 6 and 7.

The results of these corrections are shown on columns 8 and 9 of Table 1 and on Figure 1. They represent the maximum predicted noise level at one and two kilometres, in dB above kTo, for the same frequencies at which DND made background noise measurements.

Figure 1 shows that the noise level at 1 km just skims the top of the background noise at 0.5 and 1.8 MHz. Elsewhere it is lower. At 2 km the noise is well into background at all frequencies. Based on this, it is predicted that the proposed 500-kV Bruce-Essa line, which will have the same construction as the existing Milton-Claireville line, should not produce appreciable interference to reception in the LF and HF bands at the DND receiving site near CFB Borden.

Approved:

A.F. Baljet
Manager
Electrical Research Dept

Submitted:

D.E. Jones
Unit Head - Communications
System Studies Section

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REFERENCES

1. LF and HF Ambient Noise Survey and LF Antenna Pattern Measurements at CFB Borden, DND, QETE project A01499, June 13, 1980

2. CSA Standard C108.3.1-1975, Tolerable Limits and Methods of Measurement of Electromagnetic Interference from Alternating Current High Voltage Power Systems, 0.15 MHz - 30 MHz.

3. A Field Comparison of RI and TVI Instrumentation, Task Force of the IEEE Radio Noise and Corona Subcommittee, IEEE Transactions on Power Apparatus and Systems, May/June 1977, p 863-75.

4. Radio Noise Measurements on Overhead Power Lines from 2.4 to 800 kV, W.E. Pakala and V.L. Chartier, IEEE Transactions on Power Apparatus and Systems, May/June 1971, p 1155-1165.

Table 1

Maximum Predicted Radio Noise from 500-kV Bruce-Essa Transmission Line

Frequency (MHz)	Maximum Measured Noise Level (dB above 1 μv/m)	Frequency Correction (dB)	QP/RMS Correction (dB)	μv/m/kTo Correction (dB)	Attenuation (dB)		Maximum Predicted Noise Level (dB above kTo)	
					to 1 km	to 2 km	at 1 km	at 2 km
0.17		+ 11.5	- 9	+ 72	- 59	- 64	76	71
0.30		+ 5.5	- 9	+ 68	- 49	- 55	76	70
0.50	60	0	- 9	+ 63	- 39	- 45	75	69
1.8		- 13.2	- 9	+ 57	- 26.5	- 33	68	62
2.5		- 17	- 9	+ 53	- 27	- 34	60	53
5.0		- 25	- 9	+ 47	- 29	- 38	44	35
6.6		- 28	- 9	+ 45	- 32.5	- 43	36	25
9.8		- 33	- 9	+ 39	- 37	- 49	20	8
15		- 38.5	- 9	+ 37	- 37.5	- 49	12	1
20		- 42	- 9	+ 31	- 38	- 49	2	- 9
25		- 44.5	- 9	+ 30	- 39	- 49	- 3	-13

Notes - Noise was measured at 500 kHz, using an NM 21-FFT Noise meter with quasi-peak detector, located 38 meters laterally from the 500-kV Milton-Claireville transmission Line.

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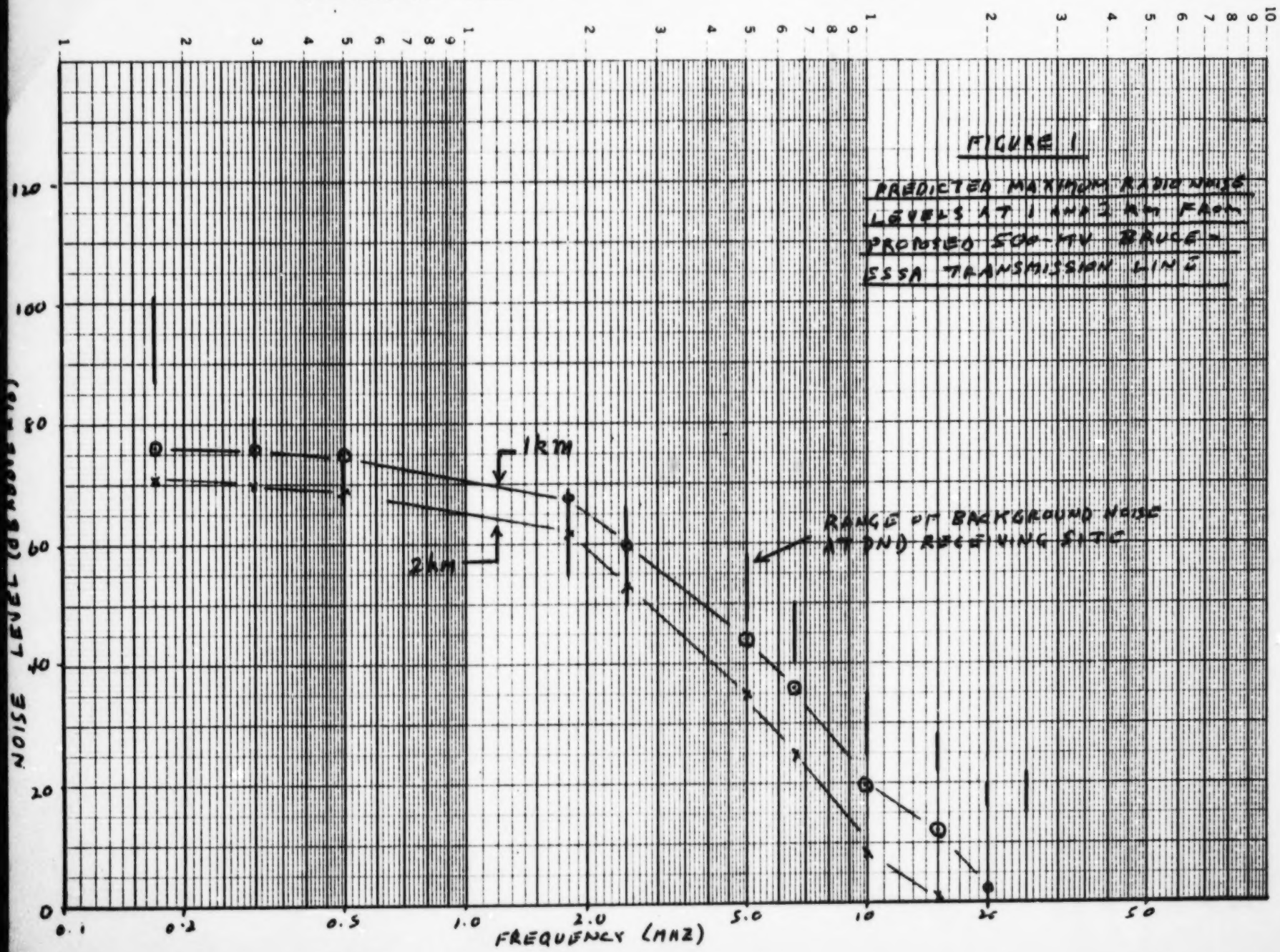

FIGURE 1

PREDICTED MAXIMUM RADIO NOISE LEVELS AT 1 AND 2 KM FROM PROPOSED 500-KV BRUCE-ESSA TRANSMISSION LINE

POOR

QUALITY

ORIGINAL